SOME ECTOPARASITES OF BATS FROM HALMAHERA ISLAND, INDONESIA[1]

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ABSTRACT: New host and distribution records are given for some ectoparasites of the families Nycteribiidae, Streblidae, Ischnopsyllidae (Insecta), Argasidae, Laelapidae, Spinturnicidae and Trombiculidae (Acari) removed from eight species of bats collected on the Indonesian island of Halmahera.

The ectoparasites upon which this report is based were collected as part of an ethnographic field research study conducted by P.M. Taylor among Tobelo-speaking peoples of Halmahera Island, Indonesia, from December 1980 to November 1981, and was sponsored locally by Khairun University, Ternate, Indonesia. The study was carried out with the cooperation of the Indonesian Institute of Sciences, and the Indonesian Nature Conservancy. Biological specimens were collected throughout the area inhabited by the Tobelo people in order to record local information on the native classification and uses of animals and plants and to provide material for zoological and botanical investigations (Taylor, 1985, in press). Halmahera (sometimes referred to as "Jilolo" or "Gilolo") is the largest island of the Moluccas. It lies on the Equator and is situated southeast of the Philippines, west of the western tip of Irian Jaya, and North of Seram. Knowledge of the ectoparasitic fauna of bats from the Moluccas and surrounding territories, and especially Halmahera, is meager, therefore the records from this survey are valuable for inventory purposes and also for elucidating our knowledge of host-parasite associations in this part of the world.

MATERIALS AND METHODS

Ectoparasites taken during this study were removed from 155 bats of 8 species, plus 16 unidentified bats, mist-netted on the Indonesian island of Halmahera (Kampung Pasir Putih, Jailolo District, at 0°53'N, 127°41'E) by P.M. Taylor and A.C. Messer in 1981. An additional specimen of

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Pteropus personatus Temminck was collected by P.M. Taylor in 1984. As field conditions allowed, care was taken to prevent contamination of ectoparasite collections from different host individuals. All ectoparasites collected were placed in 70% ethanol for later processing and identification. The bat flies and fleas are deposited in the National Museum of Natural History, and the ticks are deposited in the U.S. National Tick Collection, Museum Support Center, Smithsonian Institution, Washington, D.C. Bat nomenclature follows Honacki *et al.* (1982).

RESULTS

The bats examined for ectoparasites were as follows: *Dobsonia crenulata* K. Anderson, *Eonycteris spelaea* (Dobson), *Macroglossus minimus* (E. Geoffroy), *Nyctimene albiventer* (Gray), *Pteropus conspicillatus* Gould, *Pteropus personatus*, *Rousettus amplexicaudatus* (E. Geoffroy) (family Pteropodidae), and *Rhinolophus euryotis* Temminck (family Rhinolophidae). Table 1 depicts the host associations and the numbers of ectoparasites collected in this survey. In addition, 21 nycteribiids, 2 streblids, 208 larval ticks, and a mixture of 13 nymphal and adult spinturnicid mites were removed from 16 bat specimens from which the identification labels became detached. These ectoparasites could not be matched with individual bat species (see Table 1).

DISCUSSION

Of the 11 species of bat flies collected during this survey (7 nycteribiids, 4 streblids) the following represent new records for Halmahera: *Archinycteribia actena* Speiser, *Eucampsipoda inermis* Theodor, *Cyclopodia albertisii* Rondani, *Leptocyclopodia* (*Oncoposthia*) *macrura* (Speiser), *Phthiridium phthisicum* (Speiser) (Nycteribiidae), and *Megastrebla* (*Megastrebla*) *gigantea* (Speiser), *M. parvior* Maa, and *Raymondia pseudopagodarum* Jobling (Streblidae). Two species, *Cyclopodia* species B (Nycteribiidae) and *Brachytarsina* species A (Streblidae), apparently are undescribed but cannot be treated further until specimens of previously described, related species are obtained for comparative purposes. The ischnopsyllid flea, *Thaumapsylla longiforceps* Traub, and the laelapid mite, *Neolaelaps spinosa* (Berlese), are also new records for Halmahera.

Nycteribiidae

Archinycteribia actena has been recorded from Sulawesi (Celebes) and Seram east to the Solomon Islands and Australia (Maa, 1962, 1971; Theodor, 1967, 1968; Durden *et al.*, 1990). In the present survey it was

collected from 3 hosts (Table 1), always in association with *Cyclopodia tenuis* and either *Eucampsipoda inermis* or *Megastrebla* (*M.*) *gigantea*. Species of *Dobsonia* Palmer serve as primary hosts of *Archinycteribia actena* throughout the range of this fly with *D. crenulata* the primary host on Halmahera.

Our specimens of *Eucampsipoda inermis* from Halmahera apparently constitute the first record of the genus from the Molucca Islands. This species has been reported from Burma, Thailand, Malaya, Java, Sumba, the Philippines, and Papua New Guinea (Theodor, 1955, 1963, 1967, 1968; Maa, 1962, 1977). Its primary hosts are *Rousettus amplexicaudatus* and *Eonycteris spelaea*. On Halmahera the species also occurred primarily on these 2 hosts; however, a few specimens were collected from *Dobsonia* and *Macroglossus*. The records, other than those from the 2 primary host species, probably represent accidental occurrences.

Cyclopodia tenuis is known from Malaya, Java, Borneo and the Moluccas (Theodor, 1959, 1967; Maa, 1966, 1977). It was first reported from Halmahera by Theodor (1959) from *Macroglossus minimus*. Maa (1966) stated that Theodor's record of a single female from Halmahera needed confirmation. We are now able to verify this distribution record. This was the second most common species in our collection. On Halmahera, *Cyclopodia tenuis* was found almost entirely on *Macroglossus minimus* (originally identified as *M. lagochilus* but Honacki *et al.* (1982) list *lagochilus* as a synonym of *minimus*). This parasitic fly was taken once from *Rousettus amplexicaudatus*, once from *Eonycteris spelaea*, and once from *Nyctimene albiventer*. The latter 3 host records probably represent accidental occurrences.

Cyclopodia albertisii is known from the Moluccas (Goram), Belau (Palau) Islands, Papua New Guinea, and Australia (Theodor, 1959, 1967; Maa, 1962, 1971). Our collection from Halmahera contains 9 specimens all from a single host specimen of *Pteropus conspicillatus*. There were no other associated ectoparasites on this host specimen.

Twenty-two specimens of *Cyclopodia* species B were taken from 4 specimens of *Pteropus personatus*. This fly probably is undescribed even though it runs to *Cyclopodia bougainvillensis* Theodor in Theodor's 1967 keys. There are some differences between features in Theodor's description and those of our specimens but, until comparative material of *bougainvillensis* becomes available, it is impossible to be sure of the correct identity of our specimens.

Thirteen specimens of *Leptocyclopodia* (*O.*) *macrura* were removed from 10 specimens of *Dobsonia crenulata*, and another male was found on 1 unidentified bat. In addition to the range previously recorded for this distinctive species (Durden, *et al.*, 1990), we now add Halmahera. Associated species are listed in Table 1.

Three individual specimens of *Phthiridium phthisicum* were collected from 3 separate individuals of *Rhinolophus euryotis*, and always in association with at least 1 other species, *Raymondia pseudopagodarum* or *Brachytarsina* species A. The female of *Phthiridium phthisicum* was originally described from *Rhinolophus euryotis*, from Amboina (Speiser, 1907). The male was later described from a specimen from Seram taken from an unidentified species of *Rhinolophus* Lacepede, ". . . which according to the form of the thorax and other characters resembles the female closely [and] is considered to belong to this species." (Theodor, 1968). The identity of our female specimen is reasonably certain, but that of our 2 males is less certain. Our males do not completely coincide with Theodor's description or match his figures. It is possible that our, or Theodor's association of the sexes is wrong. Only when both sexes from a single host individual are available can a decision be made. Our specimens might be one of several subspecies mentioned by Maa (1986) but, again, comparative material is needed to be sure.

Streblidae.

Megastrebla (*M.*) *gigantea* is a widespread bat fly (Durden *et al.*, 1990). Seven specimens were collected from 3 species of bats and always in association with 1 to 3 species of Nycteribiidae (Table 1).

A single female of *Megastrebla* (*M.*) *parvior* was taken from an *Eonycteris spelaea* in association with *Eucampsipoda inermis* and *Cyclopodia tenuis*.

Five specimens of *RaBrachytarsina* (here referred to as species A) were collected from *Rhinolophus euryotis*. This fly closely resembles *Brachytarsina modesta* Jobling and *B. trinotata* Maa, but comparative material is not available to help confirm its identity.

Two males and 2 females of an apparently undescribed species of *Brachytarsina* (here referred to as species A) were collected from *Rhinolophus euryotis*. This fly closely resembles *Brachytarsina modesta* Jobling and *B. trinotata* Maa, but comparative material is not available to help confirm its identity.

Ischnopsyllidae

Thaumapsylla longiforceps was the only species of flea retrieved during this survey. Although it has been collected from several unrelated bat hosts (Hopkins and Rothschild, 1956), it appears to show a preference for various species of the genus *Rousettus* (Holland, 1969). In Java, Hadi *et al.* (1983) recorded '*Thaumapsylla* sp.' from *Rousettus leschenaulti* (Desmarest) and *Eonycteris spelaea*; the latter was the only host species from which *T. longiforceps* was recovered in this survey. *Thaumapsylla longifor-*

ceps has been reported from Java, Borneo and the Philippines southeast to New Guinea (Hopkins and Rothschild, 1956). In addition, we have seen 119 specimens from 21 previously unreported collections of *T. longiforceps*, all identified by R. Traub (pers. comm.): 73 specimens from *Rousettus amplexicaudatus* (Sumatra (8), the Philippines (41), Sulawesi (2),Flores (7) and Timor (15)); 2 specimens from *Rousettus* sp. (the Philippines); 3 specimens from *Cynopterus brachyotis* (Muller) (Sumatra (2) and Java (1); 1 specimen from *Eonycteris major* (K. Anderson) (the Philippines); and 40 specimens from unidentified bats (the Philippines (39) and New Guinea (1)).

Argasidae

All ticks collected were larvae belonging to the genus *Ornithodoros* Koch, subgenus *Reticulinasus* Schulze. All known species of this subgenus parasitize cave-dwelling megachiropteran bats (Dumbleton, 1958; Hoogstraal, 1962; Hoogstraal and Aeschlimann, 1982). Species of *Ornithodoros* (*Reticulinasus*) are known from the Near East, Africa and Madagascar eastward to India, Indo-Australia and the Solomon islands (Dumbleton, 1958; Wiroreno *et al.*, 1979; Hoogstraal and Aeschlimann, 1982). The ticks collected from Halmahera represent 3 undescribed species: most specimens belong to the species here designated as species #1, but 1 specimen removed from *Dobsonia crenulata* belongs to a second species (species #2), and 10 taken from an individual *Rousettus amplexicaudatus* include specimens of species #1 and examples of a third taxon, species #3. It is hoped that future collecting on Halmahera will produce postlarval specimens of these 3 undescribed ticks.

Laelapidae

Neolaelaps spinosa was the only laelapid mite collected in this survey. It occurred in low numbers on both *Dobsonia crenulata* and *Pteropus personatus*. This mite typically parasitizes several species of *Pteropus* and is known from Sri Lanka eastward through Indo-Australia to New Ireland (Strandtmann and Garrett, 1967). Our record from *Dobsonia crenulata* is considered to represent an accidental infestation.

Spinturnicidae and Trombiculidae

The remainder of the ectoparasites collected in this survey consisted of an estimated 6 to 9 species of spinturnicid mites, and 2 species of larval chigger mites (Trombiculidae). The host associations of these two families are shown in Table 1. Both mite groups are frequent ectoparasites of pteropodid bats, particularly in Indo-Australia (Beck, 1971; Hadi *et al.*,

Table 1. Ectoparasites of Bats from Halmahera, Indonesia.

	Dobsonia crenulata (n = 56)	*Eonycteris spelaea* (n = 29)	*Macroglossus minimus* (n = 41)	*Nyctimene albiventer* (n = 2)	*Pteropus conspicillatus* (n = 1)	*Pteropus personatus* (n = 4)	*Rousettus amplexicaudatus* (n = 18)	*Rhinolophus eunyotis* (n = 4)	Unidentified bats (n = 16)
Nycteribiidae:									
Archinycteribia actena	88♂,85♀			4♂,5♀*			6♂,7♀*		8♂,4♀
Eucampsipoda inermis	1♂,1♀*	15♂,11♀	2♀*				6♂,7♀		1♂,1♀
Cyclopodia tenuis		1♂*	31♂,29♀	1♂,1♀*			1♂*		6♂,1♀
Cyclopodia albertisii					5♂,4♀				
Cyclopodia sp. B						12♂,10♀			
Leptocyclopodia macrura	7♂,6♀*								1♂
Phthiridium phthisicum								2♂,1♀	
Streblidae:									
Megastrebla gigantea	1♂,4♀*			1♀*					1♂
Megastrebla parvior		1♀							

	Dobsonia crenulata (n = 56)	*Eonycteris spelaea* (n = 29)	*Macroglossus minimus* (n = 41)	*Nyctimene albiventer* (n = 2)	*Pteropus conspicillatus* (n = 1)	*Pteropus personatus* (n = 4)	*Rousettus amplexicaudatus* (n = 18)	*Rhinolophus eurygnis* (n = 4)	Unidentified bats (n = 16)
Raymondia pseudopagodarum								1♂,2♀	
Brachytarsina sp. A								2♂,2♀	
Ischnopsyllidae:									
Thaumapsylla longiforceps		3♂,2♀*							
Argasidae:									
Ornithodoros spp.	618L**	29L		1L			83L		208L
Laelapidae:									
Neolaelaps spinosa	1♂,3♀					3♀			
Spinturnicidae	65	159	4				49		13
Trombiculidae	74	1					1		

*Denotes new host record (some of these may represent accidental occurrences).
**L = larvae.

1983; Durden *et al.*, 1990). The chiggers showed a strong host preference for *Dobsonia crenulata* with all but 2 of the 76 specimens collected being taken from this host. Spinturnicid mites were common on *D. crenulata*, *Eonycteris spelaea* and *Rousettus amplexicaudatus*, and scarce on *Macroglossus minimus*; none were taken from the other 4 bat species examined in this survey.

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